Sheet 02

$1001 \longrightarrow 2^0 \times 1 + 0 + 0 + 2^3 \times 1 = 9$

$00110011 \longrightarrow 2^0 \times 1 + 2^1 \times 1 + 0 + 0 + 2^4 \times 1 + 2^5 \times 1 + 0 + 0 = 51$

$10000000 \longrightarrow 2^7 \times 1 = 128$

$0.100\,1001 \longrightarrow 2^{-1} + 2^{-4} + 2^{-7} = 0.5703125$

$11.111 \longrightarrow 2^0 \times 1 + 2^1 \times 1 + 2^{-1} + 2^{-2} + 2^{-3} = 3.875$

~~Holoot~~ $\longrightarrow$ 11 0 100 1

$(105)_{10}$

$(402)_{10} \rightarrow 110010001$

$(17.75)_{10} \rightarrow 10001.11$

$(0.9)_{10} \longrightarrow 0.111001\overline{10}$

$(10.65625)_{10} \rightarrow 1010.10101$

0.75 × 2	= 1.5
0.5 × 2	= 1.0
0 × 2	= 0

0.9 × 2	= 1.8
0.8 × 2	= 1.6
0.6 × 2	= 1.2
0.2 × 2	= 0.4
0.4 × 2	= 0.8
0.8 × 2	= 1.6
0.6 × 2	= 1.2
0.2 × 2	= 0.4

0.65625 × 2	= 1.3125
0.3125 × 2	= 0.625
0.625 × 2	= 1.25
0.25 × 2	= 0.5
0.5 × 2	= 1.0
0 × 2	= 0

1	105
0	52
0	26
1	13
0	6
1	3
↓	1
	0

0	402
1	201
0	100
0	50
1	25
0	12
0	6
1	3
↓	1
	0

1	17
0	8
0	4
0	2
↓	1
	0

0	1012
1	5
0	2
1	1
	0

[2] How many different binary Values can each Represent?

$6 \rightarrow 2^6 = 64$

Range S → 000000 → 111111

US → [1]11111 → [0]11111

$10 \rightarrow 2^{10} = 1024$

Rang S → 0000000000 → 1111111111

US → [1]111111111 → 0111111111

$12 \rightarrow 2^{12} = 4096$

Range S → 000000000000 → 111111111111

US → [1]11111111111 → [0]11111111111

$16 \rightarrow 2^{16} = 65536$

Range S → 0000000000000000 → 1111111111111111

US → [1]111111111111111 → [0]111111111111111

(3) $\begin{array}{r} 1010101 \\ +\ 1101100 \\ \hline 11000001 \end{array}$ $\rightsquigarrow 2^0+2^2+2^4+2^6 = 85$

$\rightsquigarrow 2^2+2^3+2^5+2^6 = 108$

$\rightsquigarrow 2^0+2^6+2^7 = 193$ ✓

(4) H.W

10100 Write 2's complement

Steps ① Convert 1 to Zero & vice versa "Called 1's complement"

② add "1" to 1's complement

Solu.

$\begin{array}{r} 01011 \\ 1+ \\ \hline 01100 \end{array}$ ← 2's Complement

(5) x_1 : 00001111

$-x_1$: $\begin{array}{r} 11110000 \\ 1+ \\ \hline 11110001 \end{array}$: 11110001

x_2 : 10101010

$-x$: $\begin{array}{r} 01010101 \\ 1+ \\ \hline 10101010 \end{array}$: 01010110

01010110

x_3 : 01111001

$-x_3$: $\begin{array}{r} 10000110 \\ 1+ \\ \hline 10000111 \end{array}$: 10000111

(6) $(-13)_{10} \rightarrow (13)_{10} \rightarrow (1101)_2$

$(01101)_2$ 1's Comp. $(10010)_2$

$\begin{array}{r} 10010 \\ 1+ \\ \hline 10011 \end{array}$

1	13/2
0	6
1	3
1	1
0	0

6 → 00011

8 → 11100111

16 → 1111111111100111

(7) 10101010 2's Comp → $\begin{array}{r} 01010101 \\ 1+ \\ \hline (01010110)_2 \end{array}$ → (6)

00111011 2's Comp. → $\begin{array}{r} 11100100 \\ 1+ \\ \hline (11100101)_2 \end{array}$ → (2)

Adding (1) & (2)

$\begin{array}{r} 01010110 \\ +\ 11100101 \\ \hline 100111011 \end{array}$

→ $2^1+2^2+2^4+2^6 = 86$

+ → $2^0+2^2+2^5+2^6+2^7 = 229$

← 1^{st} Required

↳ $2^0+2^1+2^3+2^4+2^5+2^8 = 315$

Binary	Decimal	Hexa decimal
$(1100110)_2$	$2^1+2^2+2^5+2^6$ $=(62)_{10}$	$\underbrace{0110}_{6}\ \underbrace{0110}_{6} \Rightarrow (66)_{16}$
$(101000)_2$	$2^3+2^5=(40)_{10}$	$\underbrace{0010}_{2}\ \underbrace{1000}_{2^3=8} \Rightarrow (28)_{16}$
$(1\,0\,1\,1\,0)_2$	$2^1+2^2+2^4=(22)_{10}$	$\underbrace{0001}_{1}\ \underbrace{0110}_{6} \Rightarrow (16)_{16}$

[11]

FEED $\xrightarrow{\text{Hexadecimal}}$ 1111 1110 1110 1101

decimal → $15+14+13+13=56$

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